DEPARTMENT OF NATURAL RESOURCES
WATER PROTECTION PROGRAM
WATER QUALITY MONITORING AND ASSESSMENT SECTION
WATERSHED INFORMATION SHEET

Sac River Basin: 10290106

Basin Description

This basin lies in southwestern Missouri and consists of all the land drained by the Sac River and its tributaries, covering approximately 1,969 square miles. The main tributaries are Brush Creek, Cedar Creek, of which Horse Creek is a tributary, Bear Creek, the Little Sac River, Turnback Creek, and Clear Creek. Stockton Lake is a major multipurpose reservoir that was created in 1969. It covers from 24,700 to 38,300 acres and contains from 887,000 to 1,667,000 acre-feet of water. Fellows Lake and McDaniel Lake on the Little Sac River are two smaller reservoirs that serve as drinking water sources for the city of Springfield. Stockton Lake also is effectively a drinking water source, as there are occasional transfers of water from Stockton Lake to McDaniel Lake. These are the only surface sources of drinking water in the basin. Average annual precipitation in the basin is 42-43 inches. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for Sac River Basin

Stream/Location	Watershed Area (sq.mi.)	Period Of Record	Flow (cfs)			
			90th Percentile*	Median**	10th Percentile***	7Q10 Low Flow+
Cedar Cr. near Pleasant View	420	1923-6, 1948-2001	670	72	1.2	0
Chesapeake Spring at Chesapeake	--	1926, 1932, 1936, 1954,1964-9	--	--	--	0.5
Clear Creek near Phenix	--	1962-4, 1967, 1970-1	--	--	--	1.0
Limestone Creek at South Greenfield	--	1962-4, 1966-7, 1971-2	--	--	--	0.3
Little Sac River near Morrisville	237	1968-2001	519	81	12	--
Oak Grove Branch near Brighton	1.3	1958-72	--	--	--	0
Pickeral Creek near Republic	--	1968-70	--	--	--	0
Sac River at Ash Grove	--	1962-5, 1967, 1971	--	--	--	3.5
Sac River near Dadeville	257	1966-2001	532	111	24	6
Sac River at Hwy. J below Stockton	1,292	1973-2001	3200	571	69	--
Sac River near Caplinger Mills	1,810	1974-2001	4090	969	94	--
Sons Creek near Neola	--	1964-5, 1967	--	--	--	0

South Dry Sac Creek near Springfield	13.7	1996-2001	28	5.5	1.8	--
Turnback Creek above Greenfield	252	1965-2001	573	129	32	4.5
Turnback Creek near Greenfield	--	1943, 1945-6, 1949, 1962-5	--	--	--	4.5

* Flow is less than this amount 90 percent of the time
**Flow is less than this amount 50 percent of the time
***Flow is less than this amount 10 percent of the time
+ The lowest average 7 consecutive day flow that occurs with a recurrence interval of 10 years.

Only two percent of the land in the basin is planted in row crops. Pasture, grassland, and prairie account for sixty-four percent of land use, forest and woodland for thirty percent, open water for three percent (mainly Stockton Lake), and one percent of the basin is considered urban.

The Sac River basin lies almost entirely within the Ozark Highlands physiographic province, with some of the western basin in the Osage Plains physiographic province. The uplands of the basin are relatively flat and lie in the Mississippian limestones, with occasional Pennsylvanian sandstones and shales. The plains in the southeastern portion of the basin are particularly rich in karst limestone features such as springs, caves, sinkholes, and losing streams. The land surrounding Stockton Lake and its tributaries is hilly, with streams cutting into Ordovician dolomites. There are more rugged hills around the lower Sac River and its confluence with the Osage. Due to the north-facing Ozark uplift, the lower Sac River actually flows through progressively younger formations, and its mouth is in the Pennsylvanian shales.

The Pennsylvanian sandstones and shales are impermeable to groundwater, but the limestones and dolomites that cover most of the basin are highly soluble, and there is a great deal of groundwater movement in the basin. The limestone in the Springfield area is particularly porous and fractured, creating the potential for very rapid movement of groundwater. There are 187 known springs in the basin, with most of the larger ones concentrated in the southeastern part. The springs with mean flows of over 1 cubic foot per second (cfs) are listed in Table 2.

Table 2. Major Springs in the Sac River Basin

Spring Name	County	Mean Flow (cfs)
Cove Spring (NW & SE)	Lawrence	5.27
Ritter Spring (E)	Greene	3.44
Fulbright Spring	Greene	3.35
Lumlee Spring	Lawrence	3.02
Hart Spring	Greene	2.82
Hayes Spring	Greene	2.02
Sthrom Spring	Lawrence	1.76
Clear Creek Park Spring	Greene	1.69
Trogden Spring	Greene	1.62
Valley Water Mill Spring	Greene	1.34

Ritter Spring (W)	Greene	1.32
Williams Spring	Greene	1.25

Water Quality Concerns

Acceptable water quality is defined by Missouri's Water Quality Standards [http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf] . Streams or lakes that do not meet these standards are considered "impaired". They may not be fit for certain uses, such as swimming, drinking water supply, or protection of fish and other aquatic life. Waters are considered to be "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list over 3600 classified streams and over 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are the small tributaries to classified streams that do not typically maintain pools capable of supporting aquatic life for the entire year.

Water Quality in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf

Aquatic Habitat in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf

Point Source Pollution

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater" and contains primarily treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as biological oxygen demand (BOD), suspended solids, and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 38 permitted domestic, industrial or commercial point sources discharging a combined 6.13 million gallons per day (mgd) of treated wastewater into the waters of the Sac River Basin. By far the largest two are the Springfield Northwest WWTP, at 3.5 mgd, and the Republic WWTP, at 1.2 mgd. These two facilities account for 77 percent of the total wastewater discharging to the basin. There are 544.6 miles of classified streams in the basin, of which 4.9 miles (one percent) are considered to be impaired or affected by

point source wastewater discharges. Point source discharges also impair or affect 1.5 miles of unclassified streams in the basin. The point sources that impair or affect 0.5 miles or more of stream are shown in Table 3.

Table 3. Point Sources Impairing or Affecting 0.5 or More Miles of Stream in the Sac River Basin.

Facility	Stream	Miles Impaired	Miles Affected
Republic WWTP	Dry Branch	0	2.7
Stockton WWTP	Stockton Branch	1.7	0
Humansville WWTP	Brush Creek	0.2	0.8
Collins WWTP	Coon Creek	0	0.5

Wastewater Treatment
http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf

Nonpoint Source Pollution

Nonpoint source pollution occurs when pollutants enter bodies of water at many locations over a wide area rather than at specific, well-defined points. Examples include the erosion of sediments or the entrance of polluted surface runoff or groundwater into lakes and streams. Locations of nonpoint source pollution are often widely dispersed and are difficult to identify or control.

A major nonpoint pollution concern in the Sac River basin is the potential threat to groundwater. Given the extremely porous and fractured geology of the area, contaminated surface water, such as urban runoff from the Springfield area or septic tank leachate from rural homes, could quickly flow into drinking water aquifers with a minimum of natural filtration. New wells should be sealed from the surface down to solid bedrock and abandoned wells should be plugged to prevent contaminated surface water from flowing down the wells.

Levels of fecal coliform bacteria in the Little Sac River and in some of its tributaries, such as Asher Creek, have occasionally exceeded Missouri's water quality standard for whole body contact, but not frequently enough or at high enough levels for the river to be considered impaired. These bacteria are believed to come mainly from improperly functioning domestic septic systems in suburban Springfield and from livestock around the lower portion of the river and its tributaries. These sources could potentially lead to impairment of the Little Sac River due to fecal coliform levels in the future.

Fellows and McDaniel lakes have had occasional problems with high nutrient and algae levels, leading to taste and odor problems with the drinking water taken from them. Management efforts to correct the problem have focused on improving waste treatment systems of individual households and livestock farms. While there are several large farms

in the basin which are a potential concern for water quality in certain streams, these farms have not caused major impacts to water quality basin-wide.

The Springfield Sanitary Landfill north of Springfield has leached several metals into a tributary of the North Dry Sac River. Two miles of that tributary are considered to be affected. The Fulbright landfill, a closed landfill near the Little Sac River, leached low levels of metals into the river for several years. Now a leachate interception drain exists which transfers leachates from the landfill to the Springfield Northwest treatment plant. The landfill is no longer considered to have a serious impact on the Little Sac River.

Abandoned coal mines, if not properly reclaimed, may cause severely acidic drainage into nearby streams. This has been a concern with certain mines in the western part of the basin, but now all of the abandoned mines in this basin are believed to have minimal adverse impacts on water quality.

After not being found since the mid-1970s, the endangered Niangua darter has been found in recent years in Brush Creek and Bear Creek, but the size and stability of the Niangua darter population in this basin is not well understood. A watershed management program for Brush Creek that took place from 1995 to 2001 and current improvements at the Humansville wastewater treatment plant may provide additional protection for this endangered species. A ten-year, range-wide monitoring plan for the Niangua darter that includes Brush Creek is now being conducted. It should provide more information on the darter's range and population trends.

Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require a level of treatment at least equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving wastewater discharges, stricter permit limits that do protect these waters are required. The department requires dischargers to conduct regular monitoring of discharge quality and report their results. The department also conducts regular inspections of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's Nonpoint Source Management Plan. This plan is a cooperative project between the Missouri Department of Natural Resources and many other federal, state, and local government agencies, organizations, local landowners, and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint source pollution. The most commonly supported practices are those that control soil erosion on tilled land, improve quality and quantity of forage on grazing lands, protect riparian zones, and control runoff of animal manures, fertilizers, and pesticides. The state's Nonpoint Source Management Plan is a voluntary program that provides funds, in

the form of grants, to help defray the cost of adopting improved management practices. The nonpoint source watershed management projects that have taken place in this basin are described in Table 4.

Table 4. Nonpoint Source Watershed Projects in the Sac River Basin

Watershed Name	County	Project Date	Watershed Size (Acres)	Pollutants	Acres Needing Treatment	Acres Treated	Percent of Watershed Treated
Brush Creek	Polk	1995-2001	52,520	sed., nutrients	22,725	15,061	29%
Crabtree Branch	Cedar	1990-4	4,400	sed., nut., pest.	3,180	2,120	48%
Jordan Creek	Dade	1990-4	5,500	sed., nut., pest.	3,850	1,312	24%
Panther Creek	Polk	1995-9	7,450	sed., nutrients	4,703	4,087	55%
Son's Creek	Dade	1995-9	60,600	nutrients	10,140	7,496	12%
Upper Alder Creek	Cedar	1990-4	5,650	sediment	3,864	2,120	38%

The Total Maximum Daily Load (TMDL) is a calculation of how much of a certain pollutant may enter a certain waterbody without violating water quality standards, and of limits for the discharge of that chemical by specific sources. There are four water bodies which are tentatively scheduled to have TMDLs written in the Sac River basin. These are the Little Sac River, for fecal coliform bacteria, in 2003, McDaniel Lake, for nutrients, in 2003, Fellows Lake, for nutrients, in 2003, and Stockton Branch, for BOD, in 2005.

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

For more information you can visit the following Web sites:

TMDL Fact Sheet
http://www.dnr.mo.gov/pubs/pub2090.pdf
http://www.dnr.mo.gov/env/wpp/tmdl/wpc-tmdl-EPA-Appr.htm

United States Geological Survey, Water Resources of Missouri
http://mo.water.usgs.gov/

United States Environmental Protection Agency Region 7
http://www.epa.gov/region7/water/index.htm

Missouri Department of Conservation
http://mdc.mo.gov/fish/watershed/sac/contents/340cotxt.htm

United States Army Corps of Engineers, Kansas City District
http://www.nwk.usace.army.mil/